

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 1-26 are in the case.

### **I. INTERVIEW**

At the outset, the undersigned wishes to thank the Examiner (Mr. Oh) and his supervisor (Examiner Desai) for kindly agreeing to conducting a personal interview on this application. The interview was held on February 2, 2005 and the courtesies extended by the Examiner and his supervisor were most appreciated. The substance of the interview will be clear from the comments presented below.

### **II. THE FORMAL REJECTION**

Claims 1-3 and dependent claims stand rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite for the reasons detailed on page 2 of the Action. That rejection is respectfully traversed.

The Examiner asserts that the language "at least one catalyst active for the oxidation of the alkane to the corresponding alkene and carboxylic acid" is vague and indefinite in that it is directed to a "Reach-Through" claim. The Examiner asserts that the claim reads on future catalysts which have not yet been discovered.

As noted during the interview, the fact that a patent claim covers future catalysts not yet discovered does not give rise to indefiniteness under 35 U.S.C. §112, second paragraph. It is well recognized that claims in patents may extend to developments not contemplated by the inventor at the time the application was filed. The patent law recognizes that inventors cannot necessarily contemplate each and every embodiment

that might fall within the scope of the inventive concept. Thus, it is quite usual for later discovered aspects, developed after issuance of the patent and not contemplated by a patentee, to fall within the scope of a patent claim.

The concept of "Reach-Through" claims is not applicable in the present case. Typically, a "Reach-Through" situation arises, for example, where a method of screening compounds is patented and an attempt is made to extend coverage secured by the claimed screening method to compounds discovered via the screening method. Such coverage is generally not permitted since the compounds discovered by the screening method are not an aspect of the claimed methodology of screening.

In the present case, there is no "Reach-Through" situation. The presently claimed invention defines the catalyst as "active for the oxidation of the alkane to the corresponding alkene and carboxylic acid". Such catalysts are fully described in the specification beginning at page 5, line 29. One of ordinary skill would have no difficulty in understanding the nature of the catalyst contemplated for use in the presently claimed process. No indefiniteness arises therefore in this respect.

During the interview, it was noted that the language "the contents of which are hereby incorporated by reference" appearing at page 5 line 33 through to page 6 line 1 is improper. In light of this, the wording "....hereby incorporated by reference" has been deleted from the specification, and the reference to DE 19620542 at page 6, lines 8 and 9 has been replaced by the incorporated material relating to the catalyst formula from the counterpart U.S. patent 6,034,270, and the reference to DE 129630832 at page 6 lines 16-18 has been replaced by a discussion from the counterpart U.S. patent 6,194,610. No new matter is entered.

Claim 5 has been rejected for the reasons detailed on page 3 of the Action. In response, the dependency of claim 5 has been amended so as to be dependent on claim 1, 2 or 3 rather than on claim 4.

Based on the above, it is clear that the outstanding 35 U.S.C. §112, second paragraph, rejection should now be withdrawn. Such action is respectfully requested.

### III. THE OBVIOUSNESS REJECTION

Claims 1, 4, 7, and 11-26 stand rejected under 35 U.S.C. §103 as allegedly unpatentable over U.S. Patent 5,162,578 to McCain in view of U.S. Patent 4,899,003 to Manyik et al. Claims 2, 3, 5, 6 and 8-10 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. 3,458,406 to Fisher et al in view of Manyik et al. Those rejections are respectfully traversed.

As explained during the interview, the presently claimed invention requires that both an alkane, such as ethane, **and** an alkene, such as ethylene, are reacted with oxygen in the presence of a catalyst to produce **both** a carboxylic acid such as acetic acid and an alkene such as ethylene. The inventive concept underlying the present invention is the discovery that the molar ratio of carboxylic acid produced to alkene produced can be tailored by controlling the concentration of alkene reactant introduced in the oxidation reaction zone.

Applicants noted during the interview that the cited art does not disclose or suggest the concept of adjusting or maintaining the molar ratio of alkene produced in the oxidation reaction zone to carboxylic acid produced in the oxidation reaction zone by controlling the concentration of alkene introduced into the oxidation reaction zone.

McCain aims to provide a mixed catalyst composition which produces predominantly acetic acid from ethane and/or ethylene in a process which is **selective to acetic acid** (column 3, lines 7-8 and lines 50-54). McCain is **not** interested in ethylene as a product. McCain discloses that the solution for achieving selectivity to acetic acid is to use a mixture of two catalyst species (column 3, lines 58-61). At column 1, lines 45-48, McCain states that the prior art reference, US 4,524,236, does not suggest or disclose mixed catalyst compositions for selective acid production.

On page 5 of the action the Examiner concedes that McCain does not specify adjustment of the molar ratio of alkene produced to carboxylic acid produced by controlling the concentration of alkene introduced into the reaction zone. This deficiency is not cured by Manyik. Manyik relates to a process for the conversion of ethane to ethylene (column 1, lines 6-7). Ethylene is not a feed component as required by the present invention. The process is multistage such that ethane is reacted with oxygen in the presence of a catalyst to produce at each stage an output stream comprising ethylene, acetic acid, water and unreacted ethane and oxygen. The composition of the output stream is altered by adjusting the amount of **acetic acid and/or water in the stream** (col 1 lines 32-48; claim 1). Manyik does not disclose or suggest adjusting the composition of the output stream by adjusting the concentration of alkene introduced into the reaction zone. In fact, ethylene is not a feed component in Manyik. At col. 6 lines 6 1-63, Manyik states that the preferred catalysts for use in the invention are those described in US 4,524,236.

The Examiner draws attention at page 5 of the Action to the passage at column 3, lines 10-18 of Manyik, which reads as follows:

The mole ratio of ethylene to acetic acid defines the relative yield of these products. It will be described herein, process steps for changing this ratio for use in a commercial viable process according to the invention. Thus, a commercial process can be carried out to favor the production of ethylene at the expense of acetic acid or to favor the production of acetic acid at the expense of ethylene.

As noted during the interview, this passage does not in any way suggest the concept that the molar ratio of alkene in the product and acid in the product is controlled by adjusting the concentration of the alkene introduced in the oxidation reaction zone. Rather, Manyik discloses the removal of water as a way to adjust the "distribution of the production of products in favor of ethylene at the expense of acetic acid." (column 6 lines 20-26).

There is no motivation to combine McCain and Manyik. The aims and processes of McCain and Manyik are different. McCain is specifically directed to the production of only acetic acid (column 3, lines 7-8 and lines 50-54), i.e., McCain leads specifically **away** from producing both acetic acid and ethylene, which is the subject-matter of Manyik. Thus, there would have been no motivation for the skilled person to combine a disclosure of a process aimed at producing solely acetic acid with a process which is totally contrary to this aim, i.e., one that aims to reduce the production of acid by producing ethylene as well. This is corroborated by:

(a) the nature of the catalysts used in McCain and Manyik. Manyik states at column 6, lines 56-63 that the preferred catalysts for use in the process of Manyik are those of US 4,524,236 which relates to a process for the conversion of ethane to ethylene. These catalysts are stated by McCain as not being able to selectively

produce acetic acid and therefore cannot achieve the invention of McCain (column 1, lines 45-48);

(b) any ethylene by-product produced in McCain is recycled to make more of the desired acetic acid (column 4, lines 30-34).

The Examiner states that Manyik indicates that the addition of water results in high acetic acid selectivity whilst reducing the ethylene selectivity. From this, the Examiner concludes that the skilled person would be motivated to incorporate Manyik's ethane and water into the process of McCain to increase the selectivity to acid. Applicant's disagree.

Example 1 of McCain employs water (column 11, line 13) and two runs of the experiment are carried out. In Run A, the catalyst system of McCain's invention is employed; in Run B, a comparative experiment is conducted using the preferred catalyst system of Manyik (i.e. MoVNbSbCa — see column 7, line 20 of Manyik). In Run A, 63 mol% acid is obtained; in Run B only 32 mol% acid is obtained. Example 2 of McCain describes Run A which uses the catalyst invention of McCain and Run B which is a comparative experiment using the preferred catalyst of Manyik. Ethylene is reacted with oxygen to produce acetic acid and carbon oxides. In Run A, selectivity to acetic acid was 74 mol%, in Run B it dropped to the low value of 41 mol%. Thus, much poorer results are obtained by using the system of Manyik. It is also noted that ethylene is not a required feed component in McCain. McCain, at column 1, lines 7-9, states that acetic acid may be produced by the catalytic oxidation of ethane or ethylene or mixtures of ethane and ethylene. Thus, ethane may be used as the sole hydrocarbon feed

component. The Examiner is directed to Example 7 of McCain in which the oxidation of ethane alone was carried out.

McCain clearly leads one of ordinary skill away from employing the inferior process and teaching of Manyik. Based on this, there would have been no incentive for the skilled person to incorporate any teaching from Manyik to McCain to increase selectivity to acid because McCain is already an improved process for acid production over Manyik. Even if the skilled person did choose to add additional water, greater selectivity to acid may or may not be obtained in McCain because the nature of the catalyst in McCain is different to that of Manyik.

Furthermore, even if the addition of water did achieve further selectivity to acetic acid, this is irrelevant. An essential requirement of present claim 1 is that the ethylene concentration is controlled so as to adjust the molar ratio of ethylene to acetic acid produced. McCain does not disclose or suggest this concept. Hence, a combination of McCain and Manyik would not lead the skilled person to the present invention.

Thus, for the above reasons and contrary to the Examiner's assertions, the skilled person would have no incentive to combine the teachings of McCain and Manyik and even if that person did so, neither McCain nor Manyik teaches that by varying the ethylene concentration, the product molar ratio may be adjusted/maintained at a pre-determined value. Withdrawal of the obviousness rejection is accordingly respectfully requested.

Referring to the obviousness rejection over Fisher in view of Manyik, claims 2 and 3 are independent claims directed to integrated processes having as a first step, the oxidation process of claim 1 to produce acetic acid and ethylene and reacting these

products in a second step to produce either an alkyl carboxylate, such as ethyl acetate (claim 2) or an alkenyl carboxylate, such as vinyl acetate (claim 3). Fisher relates to the purification of vinyl acetate by removal of methyl acetate and ethyl acetate impurities. The vinyl acetate is produced by reacting ethylene, acetic acid and oxygen in the presence of a catalyst.

As noted above, Manyik is completely silent on any suggestion of controlling ethylene reactant concentration to tailor acid and ethylene product ratio. The Examiner states on page 11 of the Action that Fisher has focused on the production of the final products, alkyl carboxylate and alkenyl carboxylate by using ethylene and acid. This is incorrect. Fisher is directed to the purification of vinyl acetate to remove methyl and ethyl acetate impurities (Col. 1 lines 45-52 lines 65-67; Col 2 lines 20-23; Col. 4 line 49). Thus, the only final product in Fisher is vinyl acetate.

Fisher relates to vinyl acetate. Manyik relates to ethylene and acetic acid. The two references therefore relate to completely different technical fields. In addition, Fisher is only concerned with vinyl acetate that has already been produced, and is not concerned at all with processes on how to make vinyl acetate. Thus, contrary to the Examiner's contentions, the skilled person would have no motivation to combine the teachings of Fisher and Manyik. Furthermore, as neither Fisher nor Manyik provides any teaching or suggestion on how to tailor the acetic acid to ethylene product ratio via controlling ethylene reactant concentration, and neither reference relates to the production of an alkyl carboxylate, the skilled person could not arrive at the subject-matter of claims 2, 3 or their dependent claims by a combination of Manyik and Fisher.



In light of the above, it is clear that one of ordinary skill would not have been motivated to arrive at the invention as claimed in the present application based on the combined disclosures of McCain and Manyik or Fisher and Manyik. Absent any such motivation, a *prima facie* case of obviousness has not been generated in this case. Reconsideration and withdrawal of the outstanding obviousness rejections are accordingly respectfully requested.

#### IV. CLAIM AMENDMENTS

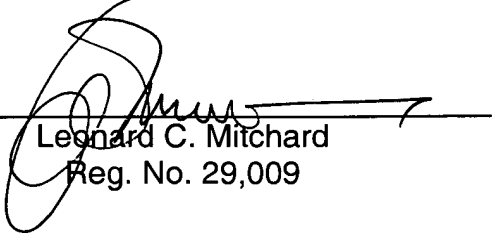
Independent claims 1-3 have been amended to yet further clarify the step methodology of the presently claimed process. Thus, a second step of the process now states that the adjusting or maintaining step is with respect to the molar ratio of alkene produced in the oxidation reaction zone to carboxylic acid produced in the oxidation reaction zone. This amendment is clearly supported by the claims and does not constitute the introduction of new subject matter. Entry and favorable consideration are accordingly respectfully requested.

Allowance of the application is awaited.

Respectfully submitted,

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